Self-supervised learning methods and applications in medical imaging analysis: a survey

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Abstract

The scarcity of high-quality annotated medical imaging datasets is a major problem that collides with machine learning applications in the field of medical imaging analysis and impedes its advancement. Self-supervised learning is a recent training paradigm that enables learning robust representations without the need for human annotation which can be considered an effective solution for the scarcity of annotated medical data. This article reviews the state-of-the-art research directions in self-supervised learning approaches for image data with a concentration on their applications in the field of medical imaging analysis. The article covers a set of the most recent self-supervised learning methods from the computer vision field as they are applicable to the medical imaging analysis and categorize them as predictive, generative, and contrastive approaches. Moreover, the article covers 40 of the most recent research papers in the field of self-supervised learning in medical imaging analysis aiming at shedding the light on the recent innovation in the field. Finally, the article concludes with possible future research directions in the field.